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## Balancing absorptive capacity and inbound open innovation for sustained innovative performance: An attention-based view

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### ABSTRACT

How can a firm develop new ideas and turn them into profitable innovations on a sustained basis? We address this fundamental issue in a novel way by developing an integrative framework of absorptive capacity (AC) and inbound open innovation that is rooted in the attention-based view of the firm. We specifically address why a balance between open and closed innovation is important from the perspective of absorptive capacity, and show how it may be brought about. Pursuing either open or closed inbound innovation alone may result in an imbalance between potential AC and realized AC as well as inward-looking AC and outward-looking AC, which will hinder innovative performance. We argue that practicing open and closed inbound innovation repeatedly and alternately by switching organizational attentions, and thus developing the associated AC, can facilitate balancing absorptive capacity and lead to innovative performance.

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### 1. Introduction

A fundamental aspect of innovation is “making novel linkages and associations” (Cohen & Levinthal, 1990: 133; also Nelson & Winter, 1982; Schumpeter, 1934). Increasingly, innovation and strategy scholars emphasize the making of “novel linkages and associations” that transcend the boundaries of the firm (e.g., Chesbrough, 2003). Thus, successful innovation performance is increasingly seen to involve the recognition of external sources of potentially valuable knowledge, the transfer of such knowledge into the firm and the deployment of it in the context of innovation, perhaps in continued cooperation with external knowledge sources (Foss, Lyngsie, & Zahra, 2013).

In spite of an increasing and widespread emphasis in research and managerial practice on such “inbound open innovation (i.e., the knowledge sourcing aspect of open innovation)”, the “benefits to openness are subject to decreasing returns” (Laursen & Salter, 2006, p. 132). Too much openness results in a negative impact on the firm’s long-term innovation success, because attention is allocated too “thinly” and control over core competences is easily lost (Enkel, Gassmann, & Chesbrough, 2009; Laursen & Salter, 2006). At the

same time, closed innovation has many weaknesses, in particular the difficulty for this model of keeping up with an increasing speed-of-innovation-time (Chesbrough, 2003). Therefore, Enkel et al. (2009) advocate simultaneous investment in closed as well as open innovation activities, that is, simultaneously leveraging internal as well as external knowledge sources in the context of innovation. However, the right balance between internal and external sources of innovation is an important issue which has not yet been satisfactorily addressed, framed and answered in the research literature (Dahlander & Gann, 2010). “Balance” may be formally defined as the combination of internal and external sources that will maximize the firm’s rent-stream from innovation over time.

We approach this important issue from the point of the allocation of attention (Ocasio, 1997). Innovation requires directing attention to the sources of innovation, because attention precedes the deployment of assets, actions and investments to innovation opportunities (Leiponen & Helfat, 2010). A firm’s attention is a limited resource that can only be allocated to a relatively small number of innovative ideas at the same time (March, 1991; Ocasio, 1997). Absorptive capacity (henceforth, AC) — defined as the “ability to recognize the value of new information, assimilate it, and apply it to commercial ends” (Cohen & Levinthal, 1990, p. 128) — is a critical component influencing the relationship between openness and innovative performance by organizing open innovation activities (Laursen & Salter, 2006). We frame AC as an attention-

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directing and action-generating capability which applies to knowledge held externally to the firm as well as to knowledge held internally.<sup>1</sup> This helps us address our overall research questions, namely *why* a balance between open and closed innovation is important and *how* such a balance may be brought about.

Absorptive capacity consists of the *potential AC* (henceforth, PAC) to recognize and assimilate and the *realized AC* (henceforth, RAC) to transform and exploit (Fosfuri & Tribó, 2008; Jansen, Van den Bosch, & Volberda, 2005; Zahra & George, 2002). Firms' open innovation activities need both PAC and RAC (idem.). The link between two components of AC in the context of various types of open innovation has not received much research attention. The current study focuses on this link. The dimension of openness has been classified into inbound and outbound (Chesbrough & Crowther, 2006). We aim to shed light on the balance in case of inbound innovation, whereas we do not include outbound innovation in our discussion. Firms' inbound innovation involves internal and external search strategies. Internal search represents "closed inbound innovation", while external search "open inbound innovation".

According to Chesbrough, Vanhaverbeke, and West (2006, p. 286), open innovation is a "cognitive model for creating and interpreting practices for profiting from innovation". Our study advances open innovation research by untangling the cognitive model of (closed vs open) inbound innovation and the link with components of AC (i.e., PAC and RAC). Absorbing knowledge from different sources may require different components of AC (Schildt, Keil, & Maula, 2012; Zahra & George, 2002). We suggest that closed inbound innovation builds relatively stronger PAC, while open inbound innovation conversely leads to a strengthening of RAC. The balance between open and closed innovation is important, because pursuing only one type of innovation will breed imbalance between PAC and RAC. Unbalanced AC further reinforces certain type of innovation, falling into a vicious cycle (Hoang & Rothaermel, 2010). In the process of discussing the role of different types of AC, we also show that different types of inbound innovation require different types of AC (i.e., inward- and outward-looking AC, Cohen & Levinthal, 1990). As a result, this study analyzes the interplay between types and components of AC and its impact on inbound innovation. The specific setting for our study is firms that have a non-trivial number of distant technological disciplines in-house (to make the study of internal knowledge sourcing non-trivial), such as General Electric or Procter & Gamble.

In sum, we explain how different forms of openness jointly shape innovative performance and complement each other. Alternating different types of inbound innovation can help a firm balance PAC and RAC as well as inward- and outward-looking AC, which leads to its innovative performance. We identify the cognitive obstacles in closed and open inbound innovation in terms of the allocation of organizational attention across different knowledge domains, and what capability is required to overcome such obstacles.

## 2. Theoretical background

### 2.1. Open and closed inbound innovation

So far, the concept of openness in the extant open innovation literature has mainly been applied to only the organization/

environment interface and not to interfaces between subunits within a firm. However, technological search and knowledge sourcing have internal aspects: Units may scan the internal environment for potentially useful knowledge. Additionally, we consider a technological boundary as another target of knowledge sourcing. In the current paper, we assume about the degree of a firm's technological diversification. Our assumption is that the firm has a number of distant technological disciplines in-house. For example, a company looking for ways to improve coatings for its floppy disks finds the solution not in the floppy disk division but in the company's soap division having surfactant technology (Nonaka & Takeuchi, 1995; Rosenkopf & Nerkar, 2001). Thus, inbound innovation involves directing organizational attention from one knowledge domain (either organizational or technological) to another (Laursen & Salter, 2006). We more specifically build on Rosenkopf and Nerkar's (2001) seminal work on boundary-spanning exploration. This paper describes four different types of innovation based on whether the knowledge source resides inside or outside the firm (organizational boundary), and whether the knowledge is related or unrelated to the firm's technology base (technological boundary): local exploration, internal boundary-spanning, external boundary-spanning, and radical exploration.

According to the definition of innovation we adopt (Cohen & Levinthal, 1990; Nelson & Winter, 1982; Schumpeter, 1934), innovation involves leveraging something old to create something new. There has to be certain prior knowledge which works as a linchpin between the old and the new (Cohen & Levinthal, 1990; Todorova & Durisin, 2007). Therefore, our main interest here lies in the types of innovation that can leverage prior technological or organizational knowledge to create new ones, and this excludes local and radical exploration from our discussion.

Local exploration is not the target of our discussion, because it incorporates neither ideas from outside the organization nor ideas that reside beyond the organization's technology domains. Spanning inside an organization and inside the current technology domain may result in "core rigidity" (Leonard-Barton, 1992). Rosenkopf and Nerkar's (2001) empirical analysis finds that local exploration has the lowest overall impact relative to other types of innovation. At the other extreme, Rosenkopf and Nerkar's (2001, p. 290) notion of radical exploration "builds upon distant technology that resides outside of the firm. The technological subunit utilizes knowledge from a different technological domain and does not obtain that knowledge from other subunits within the firm." This does not involve leveraging prior knowledge, because both organizational and technological boundaries are spanned. It makes radical exploration a particularly difficult task, requiring "connecting the dots" in a whole new territory previously not experienced. Therefore, radical exploration is also excluded from our discussion.

In sum, open and closed inbound innovations are the ones we discuss in this paper. Closed inbound innovation is equivalent to internal boundary-spanning exploration, leveraging prior organizational knowledge to absorb new technological knowledge residing in other units in an organization (Rosenkopf & Nerkar, 2001). Organizational boundaries exist between subunits inside an organization as they do between organizations. Examples would be Sony's Walkman by combining the company's cassette tape player and headphone technologies, and Yamaha's development of a play-along piano-karaoke system combining a small keyboard, a microphone, and magnetically encoded cards (Hamel & Prahalad, 1994; Nayak & Kettingham, 1986). Therefore, closed innovation can happen when innovative ideas are imported across subunits in different technology domain. Open inbound innovation is similar to Rosenkopf and Nerkar's external boundary-spanning exploration, leveraging prior technological knowledge to absorb new

<sup>1</sup> Cohen and Levinthal (1990, p. 128) argue that AC can be examined at multiple levels of analyses: country, inter-organization, and intra-organization. We focus on both the inter- and intra-organizational levels, while most research studies on AC focus solely on the inter-organizational level. Thus, the "capacity to absorb and apply" knowledge is also needed for organizational units to benefit from knowledge developed by other units (Tsai, 2001, p. 996).

organizational knowledge. Open inbound innovation is straightforward in that the source of innovative opportunity comes from outside an organizational boundary. Open innovation complements internal R&D with the innovation sources which often comes from the similar technology domain. For example, MS-Windows was built upon the operating systems knowledge developed at Apple, which borrowed the idea of graphical user interface from Xerox. The problem that we address is that firms often face barriers to recognizing, assimilating, transforming, and exploiting knowledge that must move across organizational or technological boundaries.

## 2.2. The link between attention and open innovation

Attention is a critical factor in the process of open innovation (Dahlander & Gann, 2010). Innovation is usually taken to be a cumulative activity that is enhanced by concentrating search and learning in areas of prior knowledge accumulation (Nelson & Winter, 1982). From the perspective of innovative performance, it is a perennial challenge that organizations direct their limited resources to those issues that attract their short-run attention — and there is no guarantee that this leads to an improvement of performance in the longer run (Ocasio, 1997). Attention is defined as the “noticing, encoding, interpreting, and focusing of time and effort by organizational decision makers on issues and answers” (Ocasio, 1997, p. 189). Attentional and other resource constraints tend to bias the organization in the direction of continuing exploitation and reinforcing existing resources and routines, rather than in the development of new ones (March, 1991). As a result, the default situation is a tendency for local search — which works against innovative performance. Therefore, innovation is about overcoming attentional constraints by redirecting attention to otherwise ignored knowledge sources — in either different technology domains or different organizations, while overcoming resource constraints by redeploying existing resources or acquiring new resources.

However, the attention-based view currently has some limitations with respect to analyzing the role of AC for open innovation. Just as AC research has been front-end heavy (Foss et al., 2013), so has the attention-based view. In other words, similar to how AC research has mostly focused on the recognition and assimilation (PAC) components as opposed to the transformation and exploitation (RAC) components (Volberda, Foss, & Lyles, 2010), the attention-based view has primarily addressed the attention part as distinct from the action/moves part (Ocasio, 1997). As we draw upon the attention-based view to analyze the entire cycle of inbound innovation, we attempt to make up for such shortcomings. We submit that PAC is related with “how attention is distributed to certain knowledge source”, while RAC “how distributed attention is enacted.”

## 2.3. Absorptive capacity and the allocation of attention for inbound innovation

In the attention-based view, innovation becomes possible when the firm allocates attention to the recognition, assimilation, and exploitation of new knowledge residing or hiding inside and outside the firm. Abilities to integrate knowledge within and across firms may differ, since some firms are better at using internally available knowledge while some are better at exploiting external knowledge (Todorova & Durisin, 2007). Likewise, the workings of AC may be different depending on the source of knowledge (Rothaermel & Alexandre, 2009). We argue that different types of inbound innovation require different types of AC: inward-looking AC for closed inbound innovation and outward-looking AC for open inbound innovation. Moreover, each type of inbound

innovation requires both PAC and RAC, in different properties and proportions.

When we consider the process of inbound innovation in terms of the allocation of attention, AC can be considered an attention-directing and action-generating capability which controls, allocates, and monitors organizational attention and resources (Joseph & Ocasio, 2012; Ocasio, 1997). In other words, PAC influences how attention is distributed to certain knowledge source, while RAC influences how distributed attention enables the production of output, or what Ocasio (1997; 2011) labels “organizational moves.” The connection between attention generation and PAC has been acknowledged in previous research (Todorova & Durisin, 2007). However, the relationship between organizational moves and RAC has not yet been established. Once attention is allocated to either internal or external source of innovation, making organizational moves means redeploying internally available existing resources (closed inbound innovation) or acquiring new resources to combine with existing ones (open inbound innovation) in order to exploit the new knowledge.

Most research examines a unidirectional influence of AC on innovation, but the reciprocal relationship has been acknowledged (Hoang & Rothaermel, 2010; Lane, Kota, & Pathak, 2006; Volberda et al., 2010). In a comprehensive review of AC research, Volberda et al. (2010) identifies the lack of research addressing such a reciprocal relationship as a key research gap in the literature. We attempt to fill this gap and establish the rationales for the specific link between the AC and innovation outcome. In particular, we offer a cyclical model of AC and inbound innovation, reflecting the reciprocal relationship between the two.

According to Cohen and Levinthal (1990, p. 128), the “... development of absorptive capacity, and, in turn, innovative performance are history- or path-dependent.” We argue that the key to balanced open innovation lies in breaking away from such a lock-in between only one type of innovation (e.g., open inbound innovation) and AC suitable for only that particular type of innovation, by *switching organizational attention across different organizational or technological domains*. It means that innovative performance requires continuous evolution of AC beyond a biased reinforcing cycle (i.e., what March, 1991, calls a “competence trap”), as firms need to keep absorbing innovative ideas from changing sources (internal and external) to maintain a balance.

## 2.4. A model of absorptive capacity and inbound innovation

To set the stage for a discussion of the importance of striking a balance between open and closed inbound innovation, it is necessary to understand the relationship between AC and inbound innovation. Most studies of AC focus solely on the inter-organizational level and thus concentrate on sourcing knowledge from other organizations. Yet, some studies do apply AC to the intra-organizational level knowledge flow among subunits of an organization (Gupta & Govindarajan, 2000; Jansen et al., 2005; Tsai, 2001). We focus on both inter- and intra-organizational levels, since firms should utilize both sources of knowledge to engage in balanced open innovation (Chesbrough, 2003). The mechanisms to absorb knowledge within (closed inbound innovation) and across firms (open inbound innovation) may be different (Rosenkopf & Nerkar, 2001; Rothaermel & Alexandre, 2009). This study's theoretical model is depicted in Fig. 1, which shows the reciprocal relationship between the type of inbound innovation and the relevant AC.

## 2.5. Closed inbound innovation and potential AC

It may seem that firms will find it easy to recognize and absorb internally available innovative ideas. However, we argue that

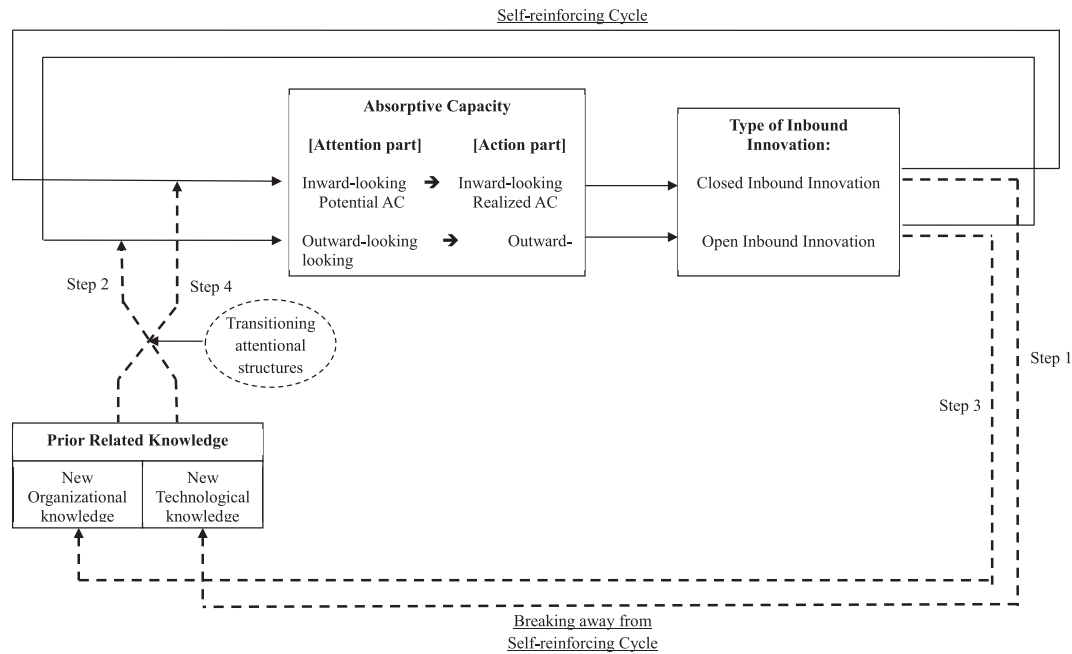


Fig. 1. An integrative framework of balanced AC and inbound innovation.

recognition and assimilation of knowledge (i.e., PAC as attention-directing capability) are main challenges to closed inbound innovation, as opposed to RAC. It needs to be noted that sometimes it is more difficult to transfer knowledge within an organization between subunits than outside organizations (Grandori, 2001). Since we assume that the firm has many distant technological disciplines in-house, it may be costly to identify and assimilate knowledge in closed inbound innovation. There is an inherent sense of parochialism between subunits (Argote & Kane, 2009) and they have little interest in what is going on in other units, particularly when they operate in distant technology domains (Nayak & Kettingham, 1986).

For these reasons, it should not be automatically assumed that it is easy for one innovating unit to recognize and assimilate the value of another unit's technology simply because they are in the same firm (Vasudeva & Anand, 2011). Rather, units in the same firm that employ different technologies are not likely to engage in close monitoring of each other, since they would not perceive each other as competitors. Therefore, the existence of knowledge inside a firm offers no guarantee that it will be recognized and assimilated unless there is a dedicated mechanism that directs the unit's attention to such knowledge (Ocasio, 1997). Indeed, due to differences in technologies, innovative ideas in other subunits often go unrecognized (Rosenkopf & Nerkar, 2001).

Cohen and Levinthal (1990) argue that assimilation (associated with PAC) is more difficult in novel domains. The cognitive distance between different technology domains of an organization's subunits (closed inbound) can be farther than the distance between different organizational domains in the similar technology area (open inbound), thus more challenging in drawing attention. Rosenkopf and Nerkar (2001) empirically show that managers have difficulties assessing the value of their own technologies in distant domains. Further complicating the challenges of recognizing the value of diverse knowledge, formal and informal communication channels develop around interactions within organizations that are critical to their tasks. These interactions produce information filters that reflect beliefs about what is and is not important. For example, the designers of controllers for a room fan may believe they need to

know much about the torque and power of the motor, but almost nothing about the materials from which the fan is made (Henderson & Clark, 1990). Yet, these information filters may prevent the recognition and assimilation of diverse intra-organizational knowledge. For closed inbound innovation to occur, such barriers should be overcome. Innovating units engaging in closed inbound innovation require capabilities to broaden search scope (PAC), and experience in inbound innovation will, in turn, enhance PAC. Of course, how much PAC is needed to absorb distant technology from different subunits will be contingent upon the degree of complementarity between the two subunits and whether the coordination mechanisms (i.e., attentional structure) are in place. Although such coordination mechanism is not within the scope of our paper, we briefly discuss attentional structure in the conclusion section.

## 2.6. Closed inbound innovation and realized absorptive capacity

Once the target knowledge residing in other subunits has been recognized and assimilated, new knowledge has to be integrated with the innovating unit's current knowledge in order to complete the transformation and subsequent exploitation of the relevant knowledge (Garud & Nayyar, 1994). In other words, attention has to be converted into actions (i.e., RAC as action-generating capability). In order for the attention to be translated into substantial organizational moves, existing resources dispersed in different subunits need to be redeployed (Ocasio, 1997). A resource reallocation mechanism that can perform this task will be the main content of RAC in case of closed inbound innovation. For example, resource reallocation practices such as "urgent project team" and "gold badge" teams can help the best resources get assigned to the most promising projects. They can pool together personnel who would otherwise work independently. These project execution teams relocate necessary resources from their original departments to innovating units at any time (Leonard-Barton & Smith, 1994).

Knowledge coming from subunits within the same firm is more likely to transfer and improve the performance of a focal unit than external knowledge (Argote, McEvily, & Reagans, 2003). Karim and

Mitchell (2004) find that internal development efforts are characterized by a greater understanding of how to coordinate and exploit multiple resources and capabilities. Garud and Nayyar (1994) provide evidences supporting the higher probability of internally generated ideas turning into meaningful innovations. These imply that closed inbound innovation, relative to open inbound innovation, has a better chance finding and allocating resources and capabilities needed for knowledge exploitation which would be available inside the firm.

### 2.7. Open inbound innovation and potential absorptive capacity

Firms usually scan the external environment prior to initiating R&D activities, often leveraging the discoveries of other firms, universities, users, etc. (Chesbrough et al., 2006). Firms engaging in open inbound innovation will seek to learn from the high quality external sources (Rosenkopf & Nerkar, 2001), which, ironically, can be more visible than internal sources. For example, Motorola's high impact patents in cellular communication technology were cited to a greater extent by its competitors (He, Lim, & Wong, 2006).

In open inbound innovation, PAC constitutes the attentional bridge between what is outside and what is inside an organization (Fosfuri & Tribó, 2008). Given the apparent opportunities presented from outside, recognition and assimilation may be easier than in the case of closed inbound innovation, particularly when the new knowledge is related to the current one. If external information is related to ongoing activity, it can be readily assimilated (Cohen & Levinthal, 1990). Recognition and assimilation of external knowledge are facilitated when a firm has some amount of prior knowledge that is basic relative to the new knowledge. Basic knowledge refers to a "general understanding of the traditions and techniques upon which a discipline is based" (Lane & Lubatkin, 1998, p. 464). Ahuja and Katila (2001) submit that when internal and external knowledge bases contain similar elements, the knowledge identification and assimilation process is much simpler. Similarities between technology domains can prepare firms to better understand knowledge from external sources (Schildt et al., 2012). Of course, this does not mean that PAC is not important for open inbound innovation. Firms should maintain monitoring systems and stay connected with external knowledge community.

### 2.8. Open inbound innovation and realized absorptive capacity

Although open inbound innovation may involve relative ease of allocating attention to provide exposure to new external knowledge, knowledge must still cross firm boundaries and be incorporated into the innovating unit's knowledge base. The main barrier to successfully completing an open inbound innovation process would be the NIH (not-invented-here) syndrome (Katz & Allen, 1982), because greater attention to external sources of innovation may confront internal resistance (Laursen & Salter, 2006). Chesbrough and Crowther (2006) also identifies the NIH syndrome and lack of internal commitment as main obstacles to open innovation. Empirical research suggests that when firms face a visible threat from external innovations, they respond by increasing the performance of their existing product or technology while failing to accommodate the new development (Anderson & Tushman, 1990). In addition, context may become a more serious problem in this case as knowledge without context is just bits of information. Knowledge can be nominally acquired but not utilized, unless the learning entity possesses the appropriate contextual knowledge necessary to make the new knowledge intelligible (Cohen & Levinthal, 1990, p. 129).

Thus, successful open inbound innovation requires the ability to import and incorporate new and more advanced knowledge from

outside and quickly combine, reconfigure, and modify it in the context of the firm's existing knowledge base. This is likely a more difficult task than in the case of closed inbound innovation where the internally dispersed resources are redeployed toward the focal innovating unit sharing the same context with the source unit. Therefore, RAC to generate organizational actions will be more critical to complete open inbound innovation process. In turn, experience in open inbound innovation will result in relatively stronger RAC than PAC.

In sum, we propose the following reciprocal relationship between inbound innovation and AC: Each type of inbound innovation may require and result in asymmetrical strengths in different components of AC. For closed inbound innovation, it is more challenging to direct attention to internally available innovative ideas but less problematic to take action to translate the allocated attention into a tangible outcome. For open inbound innovation, conversely, directing attention to external innovation sources may be less problematic, but more challenging to complete the innovation cycle. Therefore, closed inbound innovation is related to relatively more emphasis on PAC to overcome broader technological distance, while open inbound innovation relatively more emphasis on RAC to overcome broader organizational distance.

## 3. The path to balanced inbound innovation

### 3.1. Problems of pursuing one type of inbound innovation and unbalanced AC

Firms are routine-based and history-dependent systems (Nelson & Winter, 1982). At any given time firms have certain capabilities and decision rules. Rosenkopf and Nerkar (2001) show that firms have a tendency in patent citation. For example, Philips is more likely to do self-citation, while Toshiba outside-citation. Another study reports that Motorola kept citing itself in the old analog technology domain to its detriment when competitors aggressively cited Motorola's newer digital technology patents (He et al., 2006).

Inbound innovation activities will form a regular behavioral pattern or routine for a firm. Partly for this reason, organizations are much better at maintaining the *status quo* or at moving in the direction of more of the same (Nelson & Winter, 1982). Thus, considering the reciprocal relationship between AC and innovation (Volberda et al., 2010), engaging in either closed inbound innovation or open inbound innovation will reinforce the relevant associated components of AC and resulting attention distribution patterns, which further reinforce the original inbound innovation patterns. As a result, biased attentional channels may produce skewed attention. The upper part of Fig. 1 depicts such a self-reinforcing cycle.

In general, pursuing local search alone may work against innovative performance. Either closed inbound innovation or open inbound innovation can lead to better innovation performance. However, depending on only one type of inbound innovation may have its own limitations. Engaging in one type of inbound innovation will reinforce certain type of capabilities, which may gradually deteriorate the quality of innovation.

For example, prolonged open inbound innovation may increase the depth of knowledge in a given technology domain. A firm may become efficient in sustaining its current focus, but it can become inactive in exploring potential opportunities in other domains (Zhou & Li, 2012). A firm's ability to exploit external knowledge may be insufficient to maintain a sustainable competitive advantage because external knowledge is also accessible to other firms, while internally developed knowledge is not as widely accessible (Barney, 1991).

As open inbound innovation alone is insufficient, closed inbound innovation alone also has its shortcomings. When firms

choose to build upon external expertise, they are more likely to focus on highly regarded technologies. When they build upon internal expertise, however, they may be constrained to their own level of expertise (Rosenkopf & Nerkar, 2001). It is possible that closed inbound innovation could end up integrating knowledge from a not-so-competent internal unit, which may lower the quality of resulting innovation. What is worse, prolonged closed inbound innovation can make a firm overly inward-oriented and oblivious to competitors.

Therefore, when only one type of inbound innovation is pursued, AC becomes unbalanced in two ways. The first and obvious side effect is the imbalance between inward-looking and outward-looking AC. Inward-looking AC is composed of capabilities of expanding search space, making novel connections between different technologies, and redeploying internal resources around the focal innovating unit. On the other hand, outward-looking AC consists of capabilities of scanning external environment to find innovative opportunities, and combining with, reconfiguring, and modifying existing knowledge base. In order for continued and balanced open innovation to be achieved, firms need both types of AC.

Cohen and Levinthal acknowledge a “trade-off between inward-looking versus outward-looking absorptive capacities” (1990, p. 133). Rosenkopf and Nerkar (2001) also maintain that gains associated with the internal development of technology are not sustainable unless an organization is also able to integrate external developments. Excessive dominance by one or the other will be dysfunctional (Cohen & Levinthal, 1990), and continuous improvements within one domain are likely to become less applicable to other domains (Rosenkopf & Nerkar, 2001). These problems are depicted in the lower portion of Fig. 2.

The other and unintended consequence of pursuing one type of inbound innovation may be an imbalance between PAC and RAC. Both components of AC are complementary to each other. However, each type of inbound innovation may result in asymmetrical strengths in different components of AC. While PAC is relatively more important for closed inbound innovation due to the inherent difficulty of recognizing an innovation opportunity in different technology domains, RAC is more important for open inbound innovation due to the difficulty to exploit the new knowledge with the currently available resource base. Therefore, focusing on only one type of inbound innovation will result in disproportionately stimulating certain components of AC.

In short, we argue that pursuing one type of inbound innovation will over time asymmetrically reinforce different components of AC that are suitable for that particular type of inbound innovation and result in imbalance between PAC and RAC as well as between inward-looking and outward-looking AC. Firms with unbalanced AC will not be able to easily cross technological and organizational boundaries, lowering the innovative performance.

### 3.2. Alternating modes of inbound innovation

Once developed, AC does not automatically maintain or improve. Instead, it may deteriorate over time (Schildt et al., 2012) which negatively impacts innovative performance. Therefore, AC has to be regularly renewed and a firm should seek to escape from the biased self-reinforcing cycle of inbound innovation patterns in order to improve its innovative performance. It means that firms should get used to switching attentions between inside and outside. We maintain that practicing both closed inbound innovation and open inbound innovation repeatedly can facilitate balancing AC and consequently achieve innovative performance. This practice will enable firms to shift their attention inside and out with ease, leading to balanced developments of the relevant components of AC.

The linchpin between the two types of innovation is prior knowledge (Todorova & Durisin, 2007). AC as an attention-directing capability helps a firm cross technological or organizational boundaries, resulting in new prior knowledge. For prior knowledge to induce absorption of new knowledge, there is a condition, which is stated by Cohen and Levinthal (1990, p. 136) in the following:

Some portion of that prior knowledge should be very closely related to the new knowledge to facilitate assimilation, and some fraction of that knowledge must be fairly diverse, although still related, to permit effective, creative utilization of the new knowledge.

If a firm is locked in one type of inbound innovation, such new knowledge may not be further utilized due to lack of newness. Instead, organizational attention can be shifted to the other boundary (from technological domain to organizational domain and vice versa) by leveraging previous technological or organizational knowledge as prior knowledge to find a new and different source of knowledge, playing an important role in alternating between two types of inbound innovation. We illustrate the process of transitioning organizational attention with an example of a hypothetical firm in the following sequence (see the lower part of Fig. 1):

*Step 1.* New technological knowledge is brought into an innovating unit through closed inbound innovation. [For example, a floppy disc unit of a consumer product Company A searches for a solution to a new coating technology and finds it from a soap business unit with its surfactant technology.]

*Step 2.* The next step is leveraging this new knowledge (now becoming prior knowledge for the unit) by shifting the innovating unit's attention outward. [The floppy disc unit with a new disc-coating technology shifts its attention to an outside Company B with more advanced disc-coating technology. In this case, certain attentional structures which facilitate inter-firm knowledge monitoring need to be installed.]

*Step 3.* Through open inbound innovation, a firm can enhance organizational knowledge in the same technology domain. [The disc unit assimilates and exploits the new coating technology from Company B by acquiring the organizational and human resource-deploying capability. Such capability becomes Company A's new organizational knowledge. For example, it now masters how to use a new machinery and a new material to produce higher quality floppy disc.]

*Step 4.* The innovating unit can now leverage organizational knowledge by shifting its attention inward. Specifically, through closed inbound innovation, the unit can further expand its technological knowledge. [The disc unit can build on the knowledge to operate new machine and new material. For example, the laser-pick up technology in the optical division is employed and a new compact disc technology is introduced. In this case, necessary attentional structures would be those that facilitate knowledge search between business units within a firm.] And, step 1 resumes. This process may start with open inbound innovation and go through the same steps.

Such continuous transition of organizational attention will result in alternation of the two types of inbound innovation. The goal is to utilize experience gained in one learning task to improve performance on subsequent tasks, so that AC and innovation can support each other through a virtuous cycle (Lane et al., 2006). A closer examination reveals that inbound innovation is a mixed mode of exploitation and exploration: one foot is fixed in either current technology or organization domain while the other

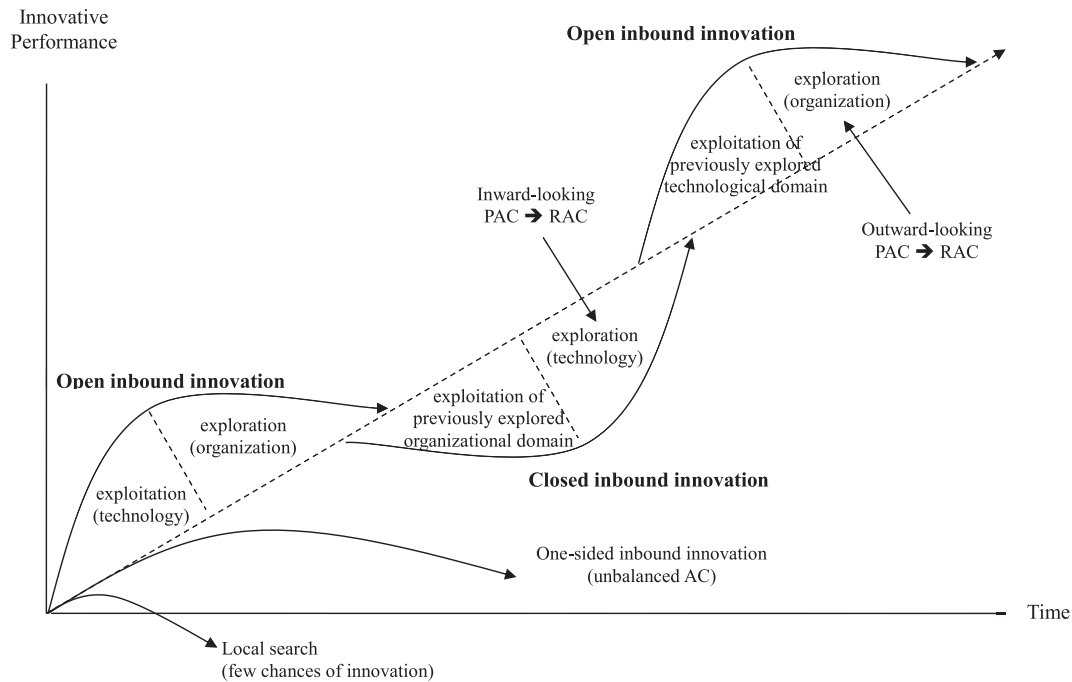


Fig. 2. Alternation between closed and open inbound innovation.

explores new technology or organizational boundaries (the diagonal line in Fig. 2). Our suggestion also satisfies the conditions for prior knowledge containing relatedness as well as newness (Cohen & Levinthal, 1990).

For a firm that follows this virtuous cycle, its experience in the internal search for a new technology (closed inbound innovation) can also enhance its ability to monitor, screen, evaluate, and leverage externally generated knowledge (Helfat, 1997). In this case, the practice of learning different technologies inside a firm through closed inbound innovation in the virtuous cycle can reinforce outward-looking AC which turns the innovating unit's attention to outside players in those technology domains. Likewise, spanning inter-firm boundaries (open inbound innovation) can lead to spanning more technological boundaries (Zhou & Li, 2012). In other words, open inbound innovation experience can reinforce inward-looking AC which facilitates the search for a new technology. Therefore, firms that are effective at dynamic, temporal sequencing between closed inbound innovation and open inbound innovation may also be the ones that are most prepared to develop a full range of AC and resulting innovative performance. In sum, we argue that balanced open innovation becomes possible by temporally and repeatedly alternating between the two types of inbound innovation, which develops balanced AC by leveraging new technological or organizational knowledge.

#### 4. Discussion of boundary conditions

The validity of the current study's arguments are constrained by many boundary conditions which are laid out below. Future research studies should consider these conditions and adjust the current paper's theoretical framework from a variety of perspectives.

##### 4.1. Exclusion of radical innovation

The current paper excludes local search and radical innovation from the discussion. Focusing on the closed and open inbound

innovation, our arguments may hold when we strictly confine the definition of closed inbound innovation involving distant technological domain and open inbound innovation same technological domain. As a result, radical innovation involving an outside organization in a different technology domain cannot be explained. However, it is likely that firms searching for external knowledge should deal with at least some amount of knowledge coming from a different domain and the decision of firms to look beyond their boundaries is likely to be driven by the need to search for knowledge from different technological boundaries. Therefore, completely excluding some degree of "radicalness" may be problematic in reality.<sup>2</sup>

##### 4.2. Size

Nelson (1959) maintains that smaller firms may not have the necessary resources to create diverse knowledge inventories. This logic implies that larger firms are more advantageous in closed inbound innovation. Our framework is likely biased toward big firms, as we explicitly consider firms that have a significant number of distant technologies in-house. Of course, the distance between subunits becomes larger as firms grow, which makes closed inbound innovation more challenging. Another related issue is that the baseline level of AC may differ between small and large firms. This factor may direct a firm's decision to give priority to open or closed innovation.

##### 4.3. Age

Considering the path-dependent nature of AC, older firms may have more opportunities for closed inbound innovation. Older firms tend to create more innovations and build more heavily on their own work (Sorenson & Stuart, 2000). By having already developed some AC in a particular area, older firms may accumulate

<sup>2</sup> We are grateful to an anonymous reviewer for inclusion of this limitation.

additional knowledge more easily in subsequent periods (Cohen & Levinthal, 1990). However, the managerial myopia or organizational lethargy of older firms can negatively affect their inbound innovation behavior.

#### 4.4. Network ties

Density of network ties facilitates knowledge exchange (Rowley, Behrens, & Krackhardt, 2000), and the stability of network ties is also conducive to knowledge exploitation. Greater internal density increases intra-organizational knowledge flows between units (Phelps, Heidl, & Wadhwa, 2012). Strength of network ties may also influence the effectiveness of inbound innovation. For example, distant and infrequent relationships (i.e., weak ties) may be more suitable for recognition and assimilation of open inbound innovation than strong ties because they provide access to novel information by linking otherwise disconnected individuals and groups (Todorova & Durisin, 2007).

#### 4.5. Managerial capabilities

Ultimately, attention is exercised by individuals. Innovation depends on where and to what the decision-makers direct their attention (Ocasio, 1997). The type of individuals needed for closed inbound innovation may be those who combine creative traits — which enable coming up with innovative ideas — with prosocial motivations,<sup>3</sup> which make them share these ideas with the rest of the organization (Washburn & Hunsaker, 2011). For open inbound innovation, individuals who can link an organization's internal network to external sources of information with extra-organizational contacts may be especially valuable (Ibarra, 1993).

Considering the above boundary conditions, our theoretical model may be only applied to established firms with multiple number of businesses and years of history: in other words, firms large and old enough to develop certain level of AC and network ties with individuals spanning organizational and technological boundaries. Small start-up firms will be able to adopt our framework in a much smaller scale.

The most critical limitation of our model is related to radical innovation. Demanding the highest level of investment in attention to both organizational and technological boundaries at the same time and putting a heavy burden on development of relevant AC, radical innovation may be difficult to achieve but does happen. Once a firm engages in the innovation cycle described by our model, it is very difficult to explain how radical innovation can happen. A firm has to jump out of the loop with no stepping stone (prior knowledge).

As much as our theoretical model contains limitations in explaining the path to radical innovation, it may nevertheless offers a hint to resolve the riddle surrounding radical innovation. Our model implies that what many consider radical innovation in fact may be an outcome of combining open and closed inbound innovation sequentially. Otherwise, a firm has to jump into previously

unknown territory (outside organization and new technology domain) all at once, which turns radical innovation a chance event. Furthermore, Kessler, Bierly, and Gopalakrishnan (2000) argue that maintaining high levels of both internal and external learning will be expensive. And, trade-offs will exist between the mechanisms that support PAC and RAC (Bierly & Chakrabarti, 1996). For example, the social network that can enhance RAC may detract from PAC. Densely interconnected networks enable trust but limit the inflow of diverse and fresh insights (Kogut, 2000).

One possible implication of our preceding discussion is that firms may be able to develop a full range of competencies, being effective at both closed and open inbound innovation capabilities. We believe those organizations that are effective at developing these innovation capabilities may also be the firms that are most prepared to engage in successful radical innovation. The implication is that, rather than directly aiming at radical innovation from the beginning, firms need to be patient enough to go through the cycle of switching between closed and open inbound innovation. Repeated experience in closed and open inbound may enhance each other in a reciprocal and mutually supporting way, and create a situation that is likely to foster radical innovation.

## 5. Conclusion

How can firms build AC for open innovation? How do they balance closed and open inbound innovation? Drawing upon the attention-based view, the current study presents an integrative framework of the balanced AC generated by alternating two types of inbound innovation. Consistent with existing thinking on, notably, the exploitation/exploration tradeoff (March, 1991), we argue that innovative performance is a matter of switching attention beyond current technological or organizational domain and following up with actions, but we add new insight into how firms can accomplish this.

Our framework first suggests that different types of inbound innovation require different types of AC: inward-looking AC for closed inbound innovation and outward-looking AC for open inbound innovation. And, each type of inbound innovation requires both PAC and RAC, in different properties and proportions. However, pursuing only one type of inbound innovation may result in an imbalance between PAC and RAC, which will hinder successful innovative performance in the long run. Accordingly, we address how firms can escape from getting locked into biased self-reinforcing cycle and develop balanced AC and consequently achieve innovative performance. Practicing two types of inbound innovation repeatedly and alternately by switching organizational attentions may be the answer.

Our study contributes to the management field by addressing the interplay between inward- and outward-looking AC and two components of AC (potential and realized) and its impact on different types of inbound innovation. Both tapping into external/internal and local/distant technological domains for innovation have been covered in the literature. What has not been explained is how different AC becomes more important than others depending on the sources of innovation. For example, in case of internal sources of innovation in distant technological domains, the capacity of the firm to identify and assimilate this knowledge can be more critical than its capacity to exploit it.

Our study also highlights the importance of switching attentions as a micromechanism in AC which is far from fully understood. Why does engaging in one type of innovation reinforce only the same type of innovation activity (March, 1991; Nelson & Winter, 1982)? Our study offers an explanation that adds to the extant literature. Pursuing certain type of innovation begets a certain profile of AC. Systems, practices, perhaps even the culture of directing attention

<sup>3</sup> Motives other than prosocial motivation are also likely to be a key factor in stimulating greater intra-organizational cooperation, and thus enhancing closed inbound innovation. Extrinsic motivation, in the form of monetary incentives, can be an important way to align effort toward organizational and business unit goals. Incentive systems that motivate effort toward broader organizational goals may be effective at enhancing closed inbound innovation. The value of intrinsic, or non-monetary based, motivation tools also needs to be noted. Osterloh and Weibel (2009) suggest that work activities that foster greater collaboration across business units are likely to increase intrinsic motivation. This increased motivation will, in turn, likely encourage information sharing across business units, thereby enhancing closed inbound innovation activities. We are grateful to an anonymous reviewer for this point.



suitable for and encouraging that particular type of innovation develop as a result. From then on, attentions get channeled into what the firm has been familiar with. Our study also goes one step further to a more dynamic view of AC by discussing the role of prior knowledge for innovative performance. In particular, we demonstrate how the experience of one type of inbound innovation can serve as the prior knowledge that facilitates the transition to the other type of inbound innovation. Finally, we attempt to make up for the weakness in AC and attention-based view literature by equally highlighting the role of RAC and organizational action as opposed to the extant interests in the PAC and organizational attention.

### 5.1. Research and managerial implications

Our study offers several research implications. First, open innovation is about how to overcome the attentional constraints by redirecting attention to otherwise ignored sources of knowledge and to overcome resource constraints by redeploying existing resources or acquiring new resources. AC plays an important role in directing and generating necessary attention. Therefore, in order to understand the process of open innovation, researchers should study the process of directing organizational attention along with the enabling or inhibiting factors. Second, depending on the characteristic of open innovation under study, a more refined treatment of AC is needed. For example, a distinction needs to be made between inward- and outward-looking AC, depending on the source of innovative ideas. Finally, balancing potential AC and realized AC is needed for the further creation, development, and evolution of AC. There may be an optimal combination between inward- and outward-looking AC and potential and realized AC. Consider two hypothetical firms. One firm has very high level of inward-looking AC and very low level of outward-looking AC. The other firm has medium level of both. The overall level of AC might not be different. But, the capability to pursue certain type of innovation will be different. The same applies to the firms with high level of PAC and low RAC as opposed to medium level of both. Simply assuming that “the higher the overall AC level, the better” may not be warranted.

Some practical implications can be also advanced. According to our reasoning, all organizations must work toward being effective at closed inbound innovation and open inbound innovation alternately and repeatedly, thereby avoiding the weakness that will inevitably follow from engaging in only one type of inbound innovation. Large, leading firms with a competitive product/business portfolio need to examine themselves and try to maximize closed inbound innovation, leveraging their internal storehouse of technology. However, they should constantly look for open inbound innovation opportunities from small or start-up firms with fresh ideas. Small firms with not much to look for inside must vigorously engage in open inbound innovation against the leading firms. However, they should not give up on the possibility of closed inbound innovation by internally gathering people with different backgrounds.

Our framework may be employed as one of the lenses to explain the innovative performance of different firms. For example, at least until recently Apple has been regarded as a company introducing one innovation after another. How did Apple achieve such breakthrough innovations as the iPod, iPhone, and iPad? Many people attribute Apple's success to the leadership and insight of the late Steve Jobs. According to our framework, however, what Jobs provided to the company may have been the opportunities and environment for transitioning of attention to two types of inbound innovation. Perhaps Apple's innovations are not so radical as many people characterize them. Rather, there may have been a series of migrations between open and closed inbound innovation, finding

and leveraging ideas, sometimes across organizational boundaries and at other times across technological boundaries: from the PC (Mac) to the PDA (Newton) to the MP3 (iPod) to the cell phone (iTunes Phone, joint venture with Motorola), and to the smart phone (iPhone). Apple's interlocking with Steve Jobs in the center as a powerful leader may have provided a fertile ground for closed inbound innovation (e.g., experience in Mac PC, Newton PDA, and iPod MP3 applied to iPhone). Added to this was Apple's shrewd skill at open inbound innovation (e.g., learning from Xerox for its OS, from the joint venture with Motorola for iTunes Phone, and learning from Knight-Ridder for its tablet PC), which made seemingly radical innovations like iPhone and iPad possible.

Continuous switching between closed and open inbound innovation may have resulted in balancing PAC and RAC for Apple, which kept improving its innovative performance. Microsoft, in contrast, seems to have been mostly engaged in open inbound innovation and has been criticized for its lack of innovation. According to Rosenkopf and Nerkar (2001), Windows was an outcome of open inbound innovation from Apple and Xerox's PARC. We also consider Excel to have resulted from open inbound innovation that exploited Lotus 1-2-3, Word from WordPerfect, and Xbox from PS and Nintendo. This is a pure conjecture at this point of time and warrants further empirical investigation, but may not be entirely groundless considering Steve Jobs' idea of innovation as taking advantage of what has been done in the past and to add something to that flow (Isaacson, 2011).

### 5.2. Future directions

Future studies may not only empirically test our theoretical conjectures but also reanalyze past cases of innovation applying our framework. Empirically testing this study's framework implies the need for longitudinal studies of mapping a firm's innovation trajectory. Currently available measures of inbound innovation and AC can be utilized for this purpose (e.g., Jansen et al., 2005).

In addition, investigating the optimal duration of one mode of inbound innovation before switching to another mode may be of particular interest. A firm may have to take time in switching between different modes of inbound innovation, considering the time-consuming nature of innovation. Too fast transitions of attention between different internal and external actors may hamper potential benefits of establishing longer, trust-based linkages to relevant actors, which is important in absorbing the necessary knowledge.

Temporal alternation of attention to closed inbound innovation and open inbound innovation should be supported by change of AC, which should be supported by appropriate organizational antecedents (Volberda et al., 2010). In the context of attention-based view, such organizational antecedents are called “attentional structures” (March & Olsen, 1976; Ocasio, 1997). For example, engaging in closed inbound innovation means that attentional structures would be mostly geared toward enhancing inward-looking AC. These structures will be characterized by intra-firm knowledge-seeking and knowledge-integrating functions. Some of the examples could be the use of teams whose job is specifically to identify linkages between different business units (Kleinbaum & Tushman, 2007) and a project execution team having the same authority as corporate managers over the company's human and physical resources (Hamel & Prahalad, 1994). Therefore, for a firm to switch from closed inbound to open inbound innovation, the attentional structure nurturing the outward-looking AC would have to be installed. Such inter-firm knowledge monitoring mechanisms as structures and policies that encourage the innovating unit members to stay involved in knowledge community (Lavie, Lechner, & Singh, 2007) may be able to trigger the transition

of attentions to other firm's innovative ideas. The specific forms of such transitioning attentional structure should be further studied.

We have not fully analyzed the relationship and possible clash between the different types of inbound innovation, when a firm tries to swing between the two modes of inbound innovation for innovative performance. Some of the AC components and structural elements related to different types of inbound innovation may negate or conflict with one another. This problem may become more salient when a firm tries to span both organizational and technological boundaries at the same time. Pursuing both modes of inbound innovation simultaneously can be confusing, unless attentional structures which enable the firm to facilitate both types of inbound innovation are in place. Or, a firm may be able to establish attentional structures or routines for implementing both open and closed inbound innovation.

Finally, the current study focuses on how to build AC for only inbound innovation. In the extant research on open innovation, inside-out process remains less explored compared to outside-in process (Enkel et al., 2009). In particular, few studies focus on a necessary capability and a capability-building process for outbound innovation. Future research could elaborate further on innovative performance in open innovation by presenting an integrative framework including four types of innovation: closed inbound, open inbound, closed outbound, and open outbound innovation.

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